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V.

Occultations and Eclipses, observed at Dorchester, Massachusetts,

BY W. CRANCH BOND.

IN making the selection of the following observations from a large number, those were taken which were thought to be the most accurate, or which presented some curious phenomena. All of them, excepting those of the years 1820, 1821, 1824, were made at my present residence in Dorchester, in the latitude $42^{\circ} 19' 20''$ North; longitude $0^{\circ} 3' 15''$ East of Harvard Hall in Cambridge, or $71^{\circ} 4' 15''$ West from Greenwich Observatory nearly.

The times of observation are given in mean solar time, civil account, for the meridian of the place of observation. They were determined by an Equatorial instrument, of thirty inches' focal length, fixed on a granite pier; the foundation of which is four feet and six inches below the surface of the ground, in a dry gravelly soil. The results of these observations were frequently compared with those deduced from altitudes, taken with a Borda's Circle, and a Sextant by Ramsden; the mean of several observations rarely differing a second from the Transit by the Equatorial. Two excellent Transit Clocks, with mercurial pendulums, the one by Holmden, the other by Parkinson and Frodsham, were relied on for the intervals. The Telescope used was a Gregorian reflector, of thirty inches, excepting for the interesting phenomenon, the occultation of Jupiter, November 14, 1820; and for the Solar Eclipse of August 27, 1821; at which times an Achromatic Telescope of forty inches was employed.

Year.	Month and Day.	Observations.	Imm. or Em.	Time.	General Remarks.
1820.	Nov. 14.	Occult. of Jupiter and Satellites. 4th Satellite, Contact of μ 's W. L. and ρ 's E. L. Total Immersion of μ 3d Satellite, First saw μ 's West Limb, Total emersion of Jupiter,	Imm. Em.	h. m. s. 7 9 35 P. M. 7 10 42 7 12 15 7 15 29 8 20 52 8 22 6	The evening was beautifully clear and calm, the moon near the meridian, and the immersions, taking place on the dark limb, were each apparently exact, Jupiter changing from the first contact as distinctly as a Solar Eclipse. The emersions of the Satellites could not be well observed. Place of observ. 1' in time E. of my present residence. Lon. $71^{\circ} 4'$. Lat. $42^{\circ} 19' 20''$.
1821.	Aug. 27.	Solar Eclipse, End, . .		10 30 13 A. M.	At the commencement the Sun was obscured by clouds. The observation was made at a place 1' in time East of my present residence. Lon. $71^{\circ} 4'$. Lat. $42^{\circ} 19' 20''$.
1823.	July 22.	Total Lunar Eclipse Beginning, Beginning of Total obsc.		8 51 30 P. M. 9 58 30	
1824.	June 26.	Solar Eclipse. Beginning,		7 27 59 P. M.	This Eclipse was observed a few minutes before Sunset from Jones's hill in Dorchester, in Lon. $71^{\circ} 4'$; Lat. $42^{\circ} 19'$ nearly. Time marked by a pocket Chronometer, Barraud's, No. 275.
1825.	Aug. 8.	Occult. of Aldebaran, .	Imm. Em.	3 25 49 A. M. 4 39 53	
1826.	March 15.	Occult. of Saturn. Emersion of centre, .	Em.	10 49 57 P. M.	
1827.	Feb. 10.	Occult. of 2α Cancr.	Imm.	7 19 54 P. M.	
1827.	Nov. 16.	Occult. of Spica Virginis.	Imm.	0 17 24 P. M.	Although so near noon, the star was distinct, its color appearing very similar to that of the moon; it lingered between one and two seconds, like a mountain projected from the moon's limb.
1828.	Jan. 31.	Occult. of 1α Cancr., .	Imm.	6 40 39.4 P. M.	
1829.	Aug. 21. " 22.	Occult. of Aldebaran, . Emersion,	Imm. Em.	11 58 54.5 P. M. 0 51 37.5 A. M.	Tremulous, two or three seconds, on the moon's enlightened limb.
1829.	Sept. 13.	Lunar Eclipse. Beginning, Contact of Shade and E. L. of Tycho, Centre of Tycho, . . . Total Immersion of Tycho,		0 32 15 A. M. 0 50 30 0 51 45 0 52 45	$6^{\circ} 4'$ on ρ 's South limb; names as given by Riccioli.

Year.	Month and Day.	Observations.	Imm. or Em.	Time.	General Rem . s.
1829.	Sept. 18.	Occult. of Aldebaran. Immersion,	Imm. Em.	h. m. s. 9 19 33.6 A. M. 10 19 49	♄'s limb not visible at the Emersion; which rendered the observation doubtful.
1829.	Sept. 24.	Occult. of α Leonis,	Imm. Em.	4 19 57.8 A. M. 4 56 36.8	The star appeared several seconds trembling on the moon's enlightened limb, disappeared, then reappeared for nearly a second, and finally immersed as given. Emersion instantaneous.
1829.	Nov. 12.	Occult. of Aldebaran,	Imm. Em.	5 6 35.5 A. M. 5 46 57.5	
1830.	Jan. 5.	Occult. of Aldebaran,	Imm. Em.	10 14 51 P. M. 11 12 50	Emersion dubious for several seconds.
1830.	March 28.	Occult. of Aldebaran,	Imm. Em.	5 6 1 P. M. 6 19 51	The <i>Emersion</i> was particularly fine; the moon's limb quiet, the star appeared instantly like a brilliant ruby <i>projected on the disk</i> , during nearly a second, and separated by a steady motion. It took place a few minutes after sunset. Alt. of the star 51°, at the Emersion.
1830.	July. 16.	Occult. of Aldebaran.	Imm.	5 33 37 A. M.	
1830.	Sept. 2.	Total Lunar Eclipse. Aristarchus emerged, . Tycho, Manilius, End of the Eclipse, . .	Em.	6 55 30 P. M. 7 7 0 7 20 15 7 44 15	The shade was discernible by the unassisted eye, two minutes after the Telescope ceased to give a vestige of it. Moon rose totally eclipsed.
1831.	Jan. 21.	Occult. of μ Ceti, . .	Imm.	5 54 54.6 P. M.	
1831.	Feb. 5.	Occult. of γ Libra, . .	Imm. Em.	5 38 5.9 A. M. 7 3 13	At the time of the Emersion, the moon's limb not visible, star faint.
1831.	Feb. 12.	Solar Eclipse. Beginning, Meridian Observations during the Eclipse. Northern intersecting Point of the ☉ and ♄'s Limbs on the middle wire, ♄'s E. L. first wire, " " mid. wire, " " third wire, ☉'s centre reduced to middle wire from the passage of his E. L., Southern intersection on the middle wire. By one observation on first wire		11 50 12.3 A. M. 0 13 34.2 P. M. 0 12 41.2 0 14 15.2 0 15 49.7 0 14 39.2 0 14 12	The sun obscured by clouds at the termination of the Eclipse. Deviation of the instrument to the Westward 5" The cusps were well defined, and the sun's limb quiet.

Year.	Month and Day.	Observations.	Imm. or Em.	Time.	General Remarks.
1831.	Feb. 13.	Occult. of Planet Venus. Immersion of the Centre, Total Immersion, . .	Imm.	h. m. s. 1 43 56 P. M. 1 44 19	The moon was not discernible. A gradual diminution, till at last it threw out some scintillations and disappeared instantly.
1831.	Feb. 19.	Occult. 1 ϵ Tauri, . .	Imm. Em.	7 31 16 1 P. M. 8 44 4.6	Emersion appeared good, but quite clear of the moon's limb.
1831.	Feb. 19.	Occult. 2 ϵ Tauri, . .	Imm. Em.	7 40 45 P. M. 8 36 11	
1831.	Feb. 19.	Occult. of Aldebaran, .	Imm.	11 43 37 P. M.	
1831.	Feb. 28.	Occult. 1 γ Virginis, .	Em.	8 31 0.2 P. M.	Star rose eclipsed.

Intending to make some experiments on the change of temperature, during the Solar Eclipse of February 12, 1831, I obtained one of Professor Leslie's Differential Thermometers; the scale affixed was graduated from zero to 90° , and adjusted to stand at 45° , when both bulbs were of an equal temperature, in order that it might show, by exposing each bulb alternately to the solar rays, a greater range of the colored fluid. The southern opening in the room for the Transit instrument afforded a convenient situation. A Fahrenheit's Thermometer was so placed that its bulb might be nearly in contact with that bulb of the Differential Thermometer which was in the shade.

The hour previous to the commencement of the Eclipse, the atmosphere being clear, a Thermometer placed in a north exposure, stood at $+29^{\circ}$. The Differential Thermometer indicated 28 divisions of its scale in the reversed positions (that being the mean of six observations, the extremes differing three divisions from the mean) as the effect produced by the solar rays; and the attached Thermometer stood at $+30^{\circ}$.

From 1 h. 10 m. to 1 h. 30 m., about the time of greatest obscuration, the northern Thermometer stood at $+24^{\circ}$, the attached at $+28^{\circ}$, and the differential indicated one division as the

effect produced by the sun's rays ; that being the mean of seven observations. The extreme difference from the mean was two divisions. A lens produced a lively motion in this Thermometer at 1 h. 40 m. ; although when the same lens was applied to a common mercurial one, the effect was not perceptible. At 2 h. 30 m. the Thermometer on the north side rose to $+ 30^{\circ}$. Clouds prevented further observation.